REMARKS

A. Status of the Claims and Explanation of the Amendments

Of the 75 claims that were originally filed, claims 1-4 and 12-75 had been previously cancelled by Applicant's amendment. Thus, prior to the submission of this paper, claims 5-11 were pending. In this paper, Applicant has added new claims 76 and 77, so that now claims 5-11, 76, and 77 are presented for examination. Support for new claims 76 and 77 are found throughout the specification (e.g., see Applicant's original claims 5 and 6).

Additionally, Applicant has amended claims 5 and 6 so that they now recite, *inter alia*, "[a] multifilament yarn comprising a linear polylactic acid...an Sn content...and a residual monomer...wherein said yarn has a tensile strength of 3.9 cN/dtex or more and a contraction ratio in boiling water of 12% or less". Support for these amendments is found, for example, in original claim 7.

Claims 5-8 currently stand rejected under 35 U.S.C. §103(a) for allegedly being unpatentable over an English translation of JP 10287735 A (JP '735). Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over JP '735, in view of U.S. Patent No. 6,174,602 to Matsui ("Matsui"). Claim 11 stands rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over JP '735, in view of Matsui, and in further view of the *Wellington Sears Handbook of Industrial Textiles* (pages 57-60).

B. Applicant's Claims Are Not Unpatentable Over the Cited References

Applicant respectfully traverses the rejection of Applicant's claims under 35 U.S.C. §103(a) as allegedly being unpatentable over the cited references, for at least the following reasons: (1) the cited references do not teach, disclose or suggest all of the claimed elements, and (2) the rejections are based on impermissible hindsight. Accordingly, the rejections should be withdrawn.

1. Claims 5-8 Are Not Unpatentable Over JP '735

The most recent Office Action, dated June 30, 2005, rejects claims 5-8 "for the reasons of record". Accordingly, Applicant has referred back to the rejection of these claims over JP '735 set forth in the previous Office Action, dated December 27, 2004. That Office Action had alleged that JP '735 discloses all claim elements of claims 5-8, with the exception of "the relative viscosity, residual monomer content, and the number average molecular weight of the polylactic acid composition produced" [Office Action of September 27, 2004, at page 3]. Despite these apparent deficiencies of JP '735, that Office Action nevertheless concluded that these claim elements would have been obvious to one of ordinary skill in the art at the time that Applicant's invention was made.

Applicant respectfully disagrees, for several reasons. Consider, for example, the claim element relating to "residual monomer content" in claim 5, which states "a residual monomer content of 0 to 0.5% by weight". The Office Action of December 27, 2004 had alleged that "it would have been obvious to one of ordinary skill in the art to remove any residual monomer from the polymerization product to remove any impurities from the finished polymer product which would lower various properties of the finished product,

including the melting temperature, tensile properties, and crystallinity" [Office Action dated December 27, 2004, page 4]. The Office Action's argument, however, is besides the point. The claim element does not call for the removal of "any residual monomer" as the Office Action suggests, but rather sufficient amounts of the monomer such that there is "a residual monomer content of 0 to 0.5% by weight". The Office Action has not provided any reference that teaches, discloses, or suggests this critical range and merely concludes that this range is obvious without any supporting evidence. Further, if the intention of the Office Action was to take official notice that this claimed range was obvious, Applicant respectfully asks the Examiner to provide a reference in support of the Office Action's arguments, pursuant to MPEP § 2144.03, Part C.

Moreover, Applicant respectfully maintains that the claimed range for the "residual monomer content" is not obvious. As shown in Table 1-2 of Applicant's specification, even if a given polylactic acid polymer has a relative viscosity within the claimed range, spinning is difficult (or the spinning workability is lowered) due to thermal decomposition of the polylactic acid [see ¶¶ [0051]-[0052] of Applicant's specification] if the "residual monomer content" is not within the claimed range. This is true even if the "residual monomer content" is reduced from 10.2% to 0.98% (a reduction by a factor of 10) [see Table 1-2]. Accordingly, assuming, arguendo, that Examiner does find a reference teaching that the reduction of residual monomer content is generally desirable, Applicant still maintains that such a reference would be insufficient if it does not teach Applicant's claimed "residual monomer content" of "0 to 0.5% by weight".

Additionally, the Office Action of June 30, 2005 argues that "the...residual monomer content include[s] the end point 0, which mean[s] that [it need not be] present in the composition. Thus, the prior art does not have to teach having [this component]" [see Office Action of June 30, 2005 at page 3]. Applicant, however, respectfully asserts that this argument is scientifically unsound, and that as general rule, polylactide polymers at the end of polymerization will contain some residual monomer, unless affirmative steps are taken to remove the monomer.[1] Thus, Applicant contends that when a reference discussing polylactide polymers is silent on the removal of residual monomer or does not specify the residual monomer content, the polylactide monomer actually contains some residual monomers, and the residual monomer content is not 0, as suggested by the Office Action. If, however, the Examiner maintains the position set forth on page 3 of the June 30, 2005 Office Action, Applicant respectfully requests Examiner (1) to clarify whether Examiner is taking official notice that polylactide polymers are understood in the art as not containing residual monomers if the reference is silent on the subject of residual monomer content, and (2) if such a position is being taken, to provide a supporting reference pursuant to MPEP § 2144.03, Part C.

For at least these reasons, Applicant maintains that the rejection of claims 5-8 under 35 U.S.C. §103(a) as allegedly being unpatentable over JP '735 should be withdrawn. JP '735 fails to teach, disclose, or suggest "a residual monomer content of 0 to 0.5% by weight".

[1] Recognizing this fact, Applicant provides examples of such procedures in paragraph [0017] of Applicant's specification.

With respect to the claim element relating to "relative viscosity", which states that the "multifilament yarn" has a "relative viscosity ηrel of 2.7 to 3.9", the Office Action alleges that

> it would have been obvious to one of ordinary skill in the art to control the number average molecular weight and optimize the claimed relative viscosity in the polylactic acid taught by JP 10287735 A so that the polymer will readily process through extrusion equipment without blocking up machinery or producing extruded products that won't maintain a film or fiber shape before cooling [Office Action of December 27, 2004, at page 4].

In drawing this conclusion, the Office Action does not mention that any other parameter should be optimized at the same time. Accordingly, the Office Action appears to be implicitly stating that the relative viscosity can be optimized independently of the other parameters. In this sense, the Office Action is considering each parameter separately, rather than considering Applicant's invention as a whole. This is not the proper legal standard. See, e.g., MPEP §2141.02.

Nor is it scientifically proper in this case. As shown repeatedly throughout Applicant's specification, even if a polylactic acid has a relative viscosity within the claimed range, a polylactide polymer is difficult to process if the Sn content is more than 30 ppm [see Comparative Examples 2-1 to 2-5 in Table 2-1], or if the residual monomer content is more than 0.5% by weight [Comparative Examples 2-6 to 2-9 in Table 2-2], or if polylactic acid has a branched structure [Comparative Example 2-10 in Table 2-4], or if the L-isomer content is 92.6 mol% (i.e., less than 98%) [Comparative Example 2-14 in Table 2-4]. Thus, one of ordinary skill in the art, if faced with developing a polylactide polymer having good processability during the manufacture of multifilament yarns, would not achieve his objective

without co-optimizing parameters as Applicant has done, even if he happened to produce a polylactide polymer with a relative viscosity in the claimed range. Accordingly, it is Applicant's view that in this situation, one of ordinary skill in the art would not have limited the polymer to having a relative viscosity in the claimed range, because without co-optimization of parameters, (as in the case of Applicant's inventive polymer compositions), one of ordinary skill in the art would not have identified the claimed range of relative viscosity as attractive or beneficial. This argument is supported by Table 2-1 of Applicant's specification, which shows that the "viscosity reduction ratio", a quantity that is measurable during the spinning process and related to the relative viscosity of the polymer (see ¶[0039] of Applicant's specification), is significantly different for polylactide polymers of Applicant's invention (Examples 1 and 2 of Table 2-1) compared to polylactide polymers which happen to have the nearly the same relative viscosity (but differ significantly in the other parameters, such as the Sn content, see Comparative Examples 1-5 of Table 2-1). For at least these reasons, Applicant contends that Office Action's argument that the claimed relative viscosity range would have been obvious is based on impermissible hindsight reconstruction. See MPEP §2145.

With respect to "tensile strength", "contraction ratio", "birefringence", and "thermal stress temperature", the Office Action of December 27, 2004 had argued that

> [a]lthough the limitations of tensile strength, concentration [sic contraction] ratio in boiling water, birefringence, and thermal peak stress temperature are not explicitly taught by JP 10287735 A, it is reasonable to presume that said limitations would be inherent to the invention. Support for this presumption is found in the use of similar materials (i.e., L-isomer lactic acid monomers, and a tin catalyst) and in the similar production steps (i.e. a ring opening polymerization process initiated by a tin catalyst) used to produce

> the polylactic acid. The burden is upon the Applicant to prove otherwise" [Office Action of December 27, 2004 at page 4].

Applicant respectfully disagrees. The mere fact that the similar materials and polymerization steps are found in JP '735 does not mean that the values of these parameters for the JP '735 polymers are the same as those for Applicant's inventive polylactide polymers. In the following, Applicant examines "tensile strength", "contraction ratio", "birefringence", and "thermal stress temperature" in turn and provides evidence that the polymers of JP '735 do not necessarily possess the properties recited in Applicant's claims merely by the virtue of being made from similar starting materials.

(1) **tensile strength and contraction ratio:** Applicant's specification notes that if the spinning speed during processing is less than 3,000 m/min, the orientation/crystallization of the polylactide polymer is insufficient [see ¶[0102] of Applicant's specification]. As a result, one only obtains a fiber with a low tensile strength, even if the fiber is drawn [see Comparative Example 2-16 in Table 2-6 of the specification]. Similarly, if the draw temperature is less than 100 °C, the resulting fiber has a low tensile strength [see ¶[0103] and Comparative Example 2-17 in Table 2-6 in the specification]. Thus, under these conditions, one would not arrive at a yarn with "tensile strength of 3.9 cN/dtex or more and a contraction ratio in boiling water of 12% or less", as recited in Applicant's amended claims 5 and 6, and claims that depend therefrom.[2] As JP '735 appears to be silent

[2] Applicant respectfully asserts that these amendments also overcome the argument in the June 30, 2005 Office Action that "applicant's repeated arguments that the prior art fails to teach producing improved heat resistance

on spinning speed, there is no reason to believe that that the polymer yarns of JP '735 would inherently possess a "tensile strength of 3.9 cN/dtex or more and a contraction ratio in boiling water of 12% or less", as recited in Applicant's claims.

(2) **Birefringence:** As noted in Applicant's specification at ¶[0083], a multifilament yarn having a tensile strength of 4.0 cN/dtex or more may be obtained by having a "birefringence, Δn, of 0.030 or more" as recited in claim 7, along with proper spinning and drawing procedures, as noted above. Again, because JP '735 is silent on the processing of the polylactide polymers to make yarn, there is no reason to believe that the polymers of JP '735 inherently have a "birefringence...of 0.030 or more".

(3) **Thermal stress temperature:** Because peak temperature of polylactic fiber shows only a weak dependence on the heat-setting temperature [cf. Comparative Example 2-17, where the heat setting temperature is 150 °C, and Comparative Example 2-18 where the heat setting temperature is 115 °C, but the respective peak temperatures of thermal stress are 81 and 79 °C.], it is generally hard to dye polylactic acid polymers. In contrast, Applicant's invention has achieved a thermal stress peak temperature of 85 °C or more by employing a high spinning speed so as to achieve a highly oriented polymer at the stage prior to drawing the yarn, and by setting the temperature for drawing (rather than heat setting) high so that

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and excellent spinning operatibility is not commensurate in scope with the present claims since these features are not recited"

the yarn is drawn at a high draw ratio [See Example 2-6 to 2-10 and Comparative Examples 2-10 to 2-19]. As a result of the highly oriented polymer chains in the multifilament yarn of Applicant's invention, the peak temperature of thermal stress can be raised, so that fatigue in dyeing at atmospheric pressure can be prevented [see ¶[0084] of Applicant's specification]. JP '735 is silent on the processing of polymers, so obtaining polylactide polymers with a thermal stress temperature in the claimed range would not have been obvious to one of ordinary skill in the art at the time the invention was made.

Finally, Applicant points out that the "inert content" as recited in claim 8 and new claims 76 and 77 is an index that relates to unevenness in thickness in the longitudinal direction of the multifilament. As shown in ¶[0010] of Applicant's specification, if the inert content is at most 3.0%, uneven dyeing seldom occurs. To obtain an inert content of at most 3.0%, one may conduct the drawing of the yarn at a temperature of 110 °C or more (see ¶[0103]of the specification]. JP '735 does not appear to teach, explicitly or otherwise, "an inert content of 3.0% or less" as recited in Applicant's claim 8 (or in new claims 76 and 77). Accordingly, claim 8 (and new claims 76 and 77) are not obvious over JP '735. See MPEP §2143.

In summary, claims 5-8 are patentable over JP '735 because (1) JP '735 fails to teach, disclose, or suggest all of the claim elements of Applicant's invention (e.g., the claimed range of residual monomer content) and (2) the rejection relies on impermissible hindsight

reconstruction of Applicant's invention. For at least these reasons, the rejection of claims 5-8 should be withdrawn.

2. Claims 9 and 10 are Not Unpatentable Over JP '735 in View of Matsui

The most recent office action (dated June 30, 2005) states that claims 9 and 10 are rejected for "reasons of record". Thus, Applicant again refers to the previous office action (dated December 27, 2004). That Office Action alleged that

> it would have been obvious to one of ordinary skill in the art to use the extrusion process described by Matsui et al. with the polylactic acid polymer of JP 10287735 A since Matsui et al. discloses how to produce filaments from polylactic acid polymers. Further, it would have been obvious to one of ordinary skill in the art to optimize the temperature range of the drawing and heat treating steps to produce filaments with a crystal structure that is oriented during the drawing step and then heat treated after the drawing step to permanently set the changes produced during drawing the finished filament. [Office Action of December 27, 2004, at page 5].

Applicant, however, has reviewed both JP '735 and Matsui and does not see where either reference, alone or in combination, teaches, discloses, or suggests the processes claimed in claims 9 and 10. Specifically, Applicant maintains that Matsui does not cure the deficiencies of JP '735 noted in the previous subsection. Thus, Applicant contends, as before, that the proposed combination of references fails to teach, disclose, or suggest all of the claim elements of Applicant's invention, and that the allegation that certain polymer parameters would have been obvious is based on impermissible hindsight. For at least these reasons, the rejection of claims 9 and 10 should be withdrawn. MPEP §2143.

3. Claim 11 is Patentable Over The Cited References

In the foregoing, Applicant demonstrated that JP '735 fails to teach, disclose, or suggest all of the claim elements of Applicant's claims 5-8. Neither Matsui nor the cited portion of the Wellington Sears Handbook alleviate these deficiencies. Accordingly, Applicant contents that claim 11, which depends from claim 5, is patentable over the cited references.

Reconsideration and withdrawal of the rejections of the claims are respectfully requested.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. **13-4500**, Order No. 3620-4014. A DUPLICATE OF THIS DOCUMENT IS ATTACHED.

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. **13-4500**, Order No. 3620-4014. A DUPLICATE OF THIS DOCUMENT IS ATTACHED.

Respectfully submitted,

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